

SAILOR®
by Thrane & Thrane

TT-3000LRIT mini-C
Installation Manual

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Document number: 98-127659

Revision: A

Release Date: 23rd of June 2008

REVISION HISTORY			
Rev.	Date	Section	Description / Remarks
A	23-6-2008	All	Initial revision

SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment.

Thrane & Thrane A/S assumes no liability for the customer's failure to comply with these requirements.

MICROWAVE RADIATION HAZARDS

During transmission this unit radiates microwaves from the antenna. This radiation may be hazardous if exposed directly to humans close to the antenna. Make sure that nobody is closer than the recommended minimum safety distance of 0.3 meter (1 ft.) during use of the transceiver.

KEEP AWAY FROM LIVE CIRCUITS

Operating personal must not remove equipment covers. Only qualified maintenance personal must make component replacement and internal adjustment. Under certain conditions, dangerous voltages may exist even with the cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

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1 INTRODUCTION

This manual describes the TT-3000LRIT mini-C and provides instructions for installation.

The TT-3000LRIT consists of following parts:

- One Inmarsat mini-C Maritime Transceiver
- One connection cable
- One pole mount kit
- One installation manual

Note. The installation does not require a TT-3616D Interconnection Box. However the TT-3616D may be purchased separately if you would like to have a more flexible installation.

1.1 IMPORTANT INFORMATION FOR TT-3000LRIT SYSTEM

A ship owner selling a vessel is responsible for informing the Accounting Authority that the TT-3000LRIT must be decommissioned. Not doing so means that he is still obligated to pay the fees.

1.2 INITIAL INSPECTION

WARNING

To avoid hazardous electrical shock, do not perform electrical tests if there is any sign of shipping damage to any portion of the outer cover. Read the safety summary at the front of this manual before installing or operating the TT-3000LRIT

Inspect the shipping carton immediately upon receipt for evidence of mishandling during the transport. If the shipping carton is severely damaged or water stained, request the carrier's agent to be present when opening the carton. Save the carton packing material for future use.

Contents of the shipment should be as listed in the enclosed packing list. If the contents are incomplete, if there is mechanical damage or defect, or if the TT-3000LRIT does not work properly, notify your dealer.

1.3 STORAGE

The TT-3000LRIT may be stored or shipped in temperatures within the limits -40°C to $+80^{\circ}\text{C}$. It is recommended that the TT-3000LRIT is unpacked immediately on delivery.

1.4 REPACKING FOR SHIPMENT

The shipping carton for the TT-3000LRIT has been carefully designed to protect the transceiver and its accessories during shipment. This carton and its associated packing material should be used when repackaging for shipment. Attach a tag indicating the type of service required; return address, model number and full serial number. Mark the carton FRAGILE to ensure careful handling.

If the original shipping carton is not available, the following general instructions should be used for repackaging with commercially available material.

- Wrap the TT-3000LRIT in heavy paper or plastic. Attach a tag indicating the type of service required; return address, model number and full serial number.
- Use a strong shipping container, e.g., a double-walled carton made of 160 kg test material.
- Seal the shipping container **FRAGILE** to ensure careful handling.

1.5 ABBREVIATIONS

AA	Accounting Authority
AORE	Atlantic Ocean Region East
AORW	Atlantic Ocean Region West
CES	Costal Earth Station
COMSAR	Sub-Committee on Radio communications and Search and Rescue
DNID	Data Network Identification number
GPS	The Global Positioning System
IMO	The International Maritime Organisation
IOR	Indian Ocean Region
ISP	Inmarsat Service Provider
ISN	Inmarsat Serial Number of the TT-3026M
LES	Inmarsat-C Land Earth Station
LESO	Inmarsat-C Land Earth Station Operator
LRIT	Long Range Identification and Tracking
MES	Mobile Earth Station (the TT-3026M)
MRCC	Maritime Rescue Coordination Centre
MSC	The Maritime Safety Committee
NCS	Inmarsat-C Network Coordination Station
Opt.	Short for option
POR	Pacific Ocean Region
PSA	Point of Service Activation
PVT	Performance Verification Test
SAC	Special Access Code
SARF	Service Activation Registration Form
SSA Message	Covert alert based on messaging protocol
SSAS	Ship Security Alert System (Requirement of SOLAS regulation XI-2)

2 SYSTEM DESCRIPTION

The standard activation mode TT-3000LRIT consists of

- TT-3026M Inmarsat mini-C Maritime Transceiver
- Opt. 943 Connection Cable, 20 meters
- Opt. 101 Pole Mount Kit
- TT-3000LRIT Installation Manual

A TT-3026M is a complete Inmarsat mini-C transceiver with built-in LNA/HPA and GPS electronics and an omni-directional antenna designed to operate on vessels. The housing is sealed and contains no user serviceable parts.

The TT-3026M is very compact and is designed to operate in a corrosive environment, and in extreme weather conditions without any service.

The TT-3026M is equipped with an 18-pole female connector and is intended for pole mounting using the Opt. 101 or Opt. 103 Pole Mount Kit. See section 3.1.1.

The TT-3026M has a built-in GPS module, capable of tracking up to 12 GPS satellites.

The TT-3026M is designed to operate when the satellite is visible over the horizon and no signal path blockage is present.

The TT-3026M antenna has an elevation angle of -15° ensuring perfect reception in sea area A3 (Inmarsat) even when the vessel has pitch and roll movements due to rough weather.

The TT-3026M performs regular scanning of the Inmarsat satellite network and will automatically perform ocean region changeover if an ocean region is found with a stronger signal.



Figure 1 TT-3026M Mini-C Transceiver

3 INSTALLATION

The figure below shows the TT-3000LRIT system configuration. The transceiver is pre-configured for LRIT.

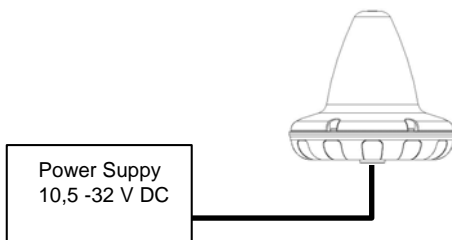


Figure 2 TT-3000LRIT Installation

3.1 INSTALLATION OF TRANSCEIVER

This chapter describes the physical mounting of the TT-3000LRIT. Refer to sections 3.1.2 and 3.1.3 for guidelines on choosing the most effective and safe mounting location for the antenna.

3.1.1 MOUNTING OPTIONS

The TT-3026M transceiver is designed for mounting on one of two pole mount adapters.

3.1.1.1 POLE MOUNT I''

Opt. 101 is a standard 1'' pole mount, illustrated in Figure 3.

- Pull the cable in the pole and adapter.
- Connect the cable to the transceiver.
- Mount the adapter on the transceiver using screws.
- Tighten the adapter to the pole.

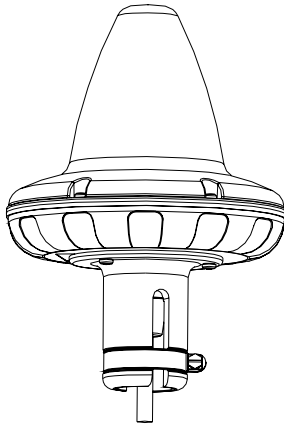


Figure 3 1" Pole mounting

Important note: When mounting the mini-C transceiver in very harsh environments i.e. directly exposed to exhaust fumes, it is recommended that the Adjustable Pole/Railing Mount described below is used!

3.1.1.2 ADJUSTABLE POLE/RAILING MOUNT

Opt. 103 is an adjustable pole/railing mount, illustrated in Figure 4.

- Attach the pole mount to the transceiver using the 3 screws.
- Mount the device to the pole in one of the 2 directions.
- Connect the cable.
- Adjustable between 20 - 35 millimetres

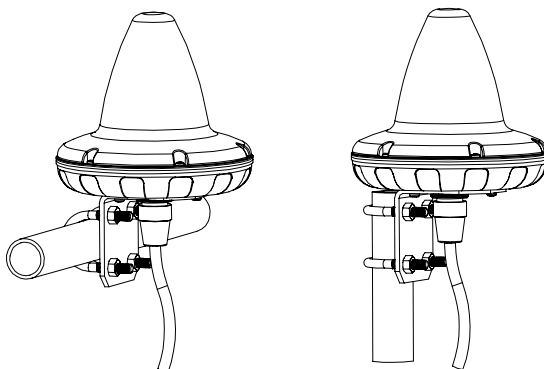


Figure 4 Vertical and Horizontal adjustable pole mount

3.1.2 ANTENNA MOUNTING CONDITIONS

When installing the TT-3026M easyTrack, find a location that is as free as possible from obstructions. Also maintain a certain distance to other antennas, especially radar installations. Normally the best place for the antenna would be above radar scanning antennas. The following safe distances should be maintained:

Distance to HF antennas	> 5 meter
Distance to VHF antennas	> 4 meter
Distance to other Inmarsat transceiver	> 0.5 meter
Distance to magnetic compass	> 0.3 meter

Table 1 Antenna Safe Distance

The antenna is designed to provide satellite coverage even when the vessel has pitch and roll movements up to 15°. To maintain this coverage the antenna should be free from obstructions in the area down to 15° below the horizon (see Figure 5). Since this may not be possible in the fore and aft directions of the vessel, the clear area can be reduced to 5° below the horizon in the fore and aft directions and 15° below the horizon in the port and starboard directions. Any compromise in this recommendation could degrade performance.

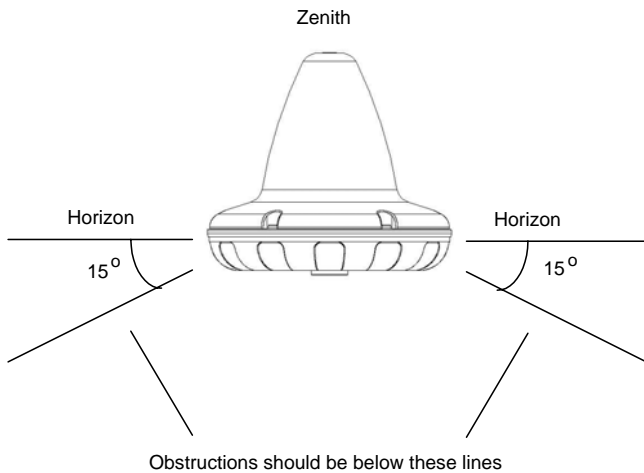


Figure 5 Viewing Angle to the Horizon

If an obstruction such as a pole or a funnel is unavoidable, the transceiver must be positioned in such a location that the obstruction covers no more than a 2° arc along the horizon. To calculate the minimum distance, use the following formula:

$$\text{Safe distance} = 29 * \text{Diameter of obstruction}$$

Example:

Obstruction is a 4" pole (Diameter = 0.1 meter)

Safe distance is $29 * 0.1 \text{ meter} = 2.9 \text{ meter}$

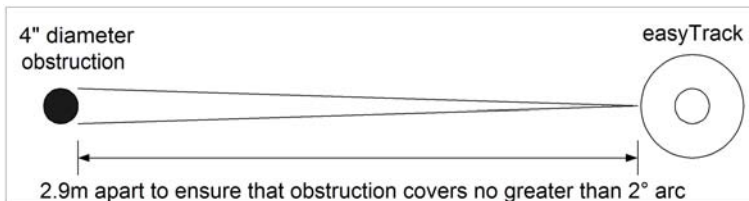


Figure 6 Mounting near pole or funnel (overhead view)

3.1.3 SAFETY DISTANCE FOR ANTENNA UNITS

When transmitting, the electromagnetic field radiated from the antenna can be harmful. To avoid danger, keep a safety distance of 0.3 meter (1 ft.) from the transceiver.

To be sure that this distance is respected, the TT-3026M is provided with a label declaring a minimum safety distance of 0.3 meter (1 ft.) on the antenna.

The relation between the power intensity and distance is as follows:

Distance (m) from antenna	Radiated intensity (W/m ²)
0.20	10
0.13	25
0.07	100

Table 2 Radiated intensity

3.1.4 CONNECTING POWER TO TT-3000LRIT

The TT-3000LRIT system is designed to operate on floating DC in the range 10.5 - 32 V when using 20-meter transceiver connection cable and 16 - 32 V when using 50-meter transceiver connection cable, which makes an AC/DC converter needed, in case the system works in an AC environment.

NOTE the requirement for floating DC of minimum 16V when using a transceiver connection cable longer than 20 meters. This is important for the operation of the TT-3000LRIT system.

In order to prepare the transceiver cable for mounting, start by removing approx 20 cm. of isolation as shown in the figure below.

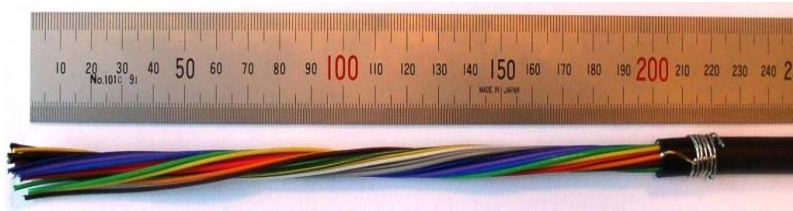


Figure 7 Transceiver cable preparation.

Then wind the tinned wire around the isolation as shown below in order to prepare for a proper grounding of the cable screen.



Figure 8 Preparation for grounding of the cable screen.

Wire colour in transceiver cable	Function
Red	DC+
Red	DC+
Black	DC-
Black	DC-
Black/Violet	3V3 out
White	GND
Black/Blue	I/O 1
Grey	I/O 2
Black/Yellow	I/O 3
Black/Grey	I/O 4
Brown	I/O 5
Black/Green	I/O 6
Yellow	Remote On/Off
Orange	GND
Blue	CTS
Violet	RTS
Green	RD
Black/Red	TD
Cable shield	GND

Table 3 Transceiver-cable colour coding

1. Connect the cable screen to the ship chassis for grounding.
2. Connect the Ships negative supply wire to the two thick black wires (DC-) of the transceiver cable.
3. Connect the Orange wire (GND) to the Yellow wire (Remote On/Off).
4. Connect the Ships positive supply wire to the two thick red wires (DC+) of the transceiver cable.
It is recommended to insert an on/off switch to be able to switch the power to the terminal off and on.

5. To verify that the terminal is operational, measure the voltage between the Black/Violet wire (3V3 out) and White wire (GND). The voltage should be 3.3Volts. If not, the terminal is not operational.
6. Cut off or terminate all other wires to avoid any short circuiting.

4 REGISTRATION

Before use of the TT-3000LRIT system on the Inmarsat-C system, it must be registered with Inmarsat. This involves a little paper work and is done using the SARF (Service Activation Registration Form) supplied with the TT-3000LRIT.

The SARF for registration of Maritime MES can also be found on www.inmarsat.org (CUSTOMER SUPPORT -> SERVICE ACTIVATION). The site also contains notes on how to complete the maritime form.

The TT-3000LRIT includes a registration form for Maritime Mobile Earth Stations. The Service Activation Registration Form contains different abbreviations that will be explained here.



**Registration for service activation
of Maritime Mobile Earth Station**

PSA use only code

Application number

Date Day Month Year

Customer's reference number

Sections 1-4, 6 and 8 are to be completed by all customers
Tick Boxes as appropriate.
Please write in block capitals

1. Your details (See note A) PLEASE NOTIFY YOUR PSA IF ANY OF THESE DETAILS CHANGE OR YOU ARE NO LONGER THE OWNER OF THE INMARSAT EQUIPMENT. (THIS IS A LEGAL REQUIREMENT AS STATED IN THE INMARSAT TERMS AND CONDITIONS WHICH ARE ATTACHED TO THE BACK OF THIS SARF)

Address

Town/city State/province

Post/ZIP code Country

Telephone + Country code () Area code () Telephone number ()

Facsimile + Country Code () Area code () Facsimile number ()

Email address

Contact person

Title Department

What is their telephone number and/or extension? + Country code () Area code () Telephone number ()

2. Paying the bill (See note B) PLEASE NOTIFY YOUR PSA URGENTLY IF YOU CHANGE YOUR BILLING ENTITY (AA or ISP.) (THIS IS A LEGAL REQUIREMENT AS STATED IN THE INMARSAT TERMS AND CONDITIONS WHICH ARE ATTACHED TO THE SARF)

Note: Maritime MESs that MAY BE used for any distress and safety purposes MUST have an Accounting Authority. However, FLEET F77 (only) may use either an Accounting Authority or an Inmarsat Service Provider

Will the MES be used for distress and safety purposes? Yes No

If YES, enter the Accounting Authority Code (AAIC)

If the Code is unknown, enter the name of the AA

If NO, have you arranged payment of calls for this MES through (tick one)

(a) Accounting Authority (AA) (b) Inmarsat Service Provider (ISP)

Enter ISP or AA Code

If the Code is unknown enter the name of the ISP or AA

3. What type of Mobile Earth Station (MES) are you registering? (See note C)

NOTE: If the terminal is activated as Maritime Fixed and placed on a vessel, you could be Endangering Lives At Sea.

Environment usage	The System	What will be the primary use of the MES?
Maritime <input type="checkbox"/>	Inmarsat-A <input type="checkbox"/>	Trading <input type="checkbox"/> Yachts <input type="checkbox"/>
Maritime Fixed <input type="checkbox"/>	Inmarsat-B <input type="checkbox"/>	Passenger/Cruise <input type="checkbox"/> Other <input type="checkbox"/>
	Inmarsat-C/mini C <input type="checkbox"/>	Offshore <input type="checkbox"/> please specify <input type="text"/>
	Inmarsat-M <input type="checkbox"/>	Government <input type="checkbox"/>
	Inmarsat mini-M <input type="checkbox"/>	Fishing <input type="checkbox"/>
	Inmarsat Fleet <input type="checkbox"/>	

What will be the country of registry of this MES?

Mobile Earth Station (MES) manufacturer Mobile Earth Station (MES) model

Figure 9 Page 1 of the Service Activation Registration Form

In addition to the general information like name, address, etc. the ISN of the MES must be specified. The ISN is located on the Delivery Note and on the bottom of the MES.

For the TT-3000LRIT registration the following guidelines should be followed:

- Select NO in section 2. “Will the MES be used for distress and safety communication”
- Select MARITIME in section 3. “Environmental usage”
- Select INMARSAT-C/MINI-C in section 3. “The System”
- Write TT-3026M in section 3. “MES model”
- Select OTHER in section 3. “What will be the primary use of the MES”
- Write “LRIT” in section 3. “please specify”
- Update section 6. on Distress and safety /Emergency Contact Details.

5 TESTING OF THE TT-3000LRIT

It is recommended that the TT-3000LRIT signal path is tested. This can be done by requesting a LESO in the Inmarsat-C system to perform a PVT (Performance Verification Test) on the mobile under test.

The LESO operator returns the result of the test, which is either that the mobile passed or failed the test. A written result might look like:

```
Test      Id  Group      Start time      End time      Overall result
pvt test  ssm  subsystem  20031028 15:07:45  20031028 15:17:07  finished pvt
```

Any further requirements for testing are defined by the Flag State authority.

5.1 TROUBLE SHOOTING

Reason:	Solution:
Error in basic TT-3000LRIT system	Check that the system is installed correctly and powered on. Check that 3.3Volts can be measured between the Black/Violet wire (3V3 out) and White wire (GND)
No satellite link	Check line of sight between TT-3026M and the satellite.

Table 4 Trouble shooting

6 TECHNICAL SPECIFICATION

Model	TT-3026M (TT-3000LRIT)
General Specifications	Meets all INMARSAT specifications for the Inmarsat mini-C Network for Land mobile and Maritime terminals. R&TTE
Transmit Frequency	1626.5 to 1660.5 MHz. note 1
Receive Frequency	1525.0 to 1559.0 MHz. note 1
Channel Spacing	5 / 2.5 kHz.
Modulation	1200 symbols/sec BPSK.
Data Rate	600 bit/sec.
Terminal Interface	EIA/TIA-232-E DTE interface. CCITT Rec.V.24/28, 4800-115000 Baud IA-5 code
System Set-up	S-RAM Battery backup
I/O Interface @ max. 20 meter cable	Six dedicated In/Out pins. Open collector. Sinks 25 mA each.
I/O Interface @ max. 50 meter cable	Six dedicated In/Out pins. Open collector. Sinks 19 mA each.
DC Power Source @ max. 20 meter cable. Limited power sources <100VA	10.5 to 32 V floating DC Max limit 100VA Max current 4A Max power 32W Power: RX: 1,8W, TX: 23 W @ 12V supply
DC Power Source @ max. 50 meter cable. Limited power sources <100VA	16 to 32 V floating DC Max limit 100VA Max current 2A Max power 32W Power: RX: 1,8W, TX: 23W @ 16V supply
Fuse	Self recovering Poly fuse
Ambient Temperature	-35°C to 70°C operating -40°C to 80°C storage.
Dimensions	Ø=163 mm H: 143 mm
Weight	1.10 kg

Note 1: *Inmarsat-C frequencies:*

TX: 1626,5 – 1646,5 MHz

RX: 1530 – 1545 MHz

Operating system	The TT-3026M makes use of eCos™ operating system.
Inmarsat-C Protocol support	<p>Polling and data reporting with automatic transmission of position reports up to maximum of 1 per 5 minutes.</p> <p>Unreserved Data reporting.</p> <p>Enhanced Pre-Assigned Data Reporting.</p> <p>Automatic ocean region shift for global coverage; 24hour scanning for strongest signal; scanning on signal loss</p>
TT3026M Transceiver	<p>Inmarsat-C/GPS omnidirectional antenna, RHC polarised.</p> <p>G/T: -23,7 dB/K at 5° elevation</p> <p>EIRP: 7 dBW dB at 5° elevation.</p>
Enclosure notation	Lloyds approved for IP 66; T&T tested for IP68
Ice	Up to 25 mm.
Velocity	Max velocity up to 140 km/hour (87mph).
Vibration Operational	<p>Random 5-20 Hz: 0.005 g²/Hz</p> <p>20-150 Hz: -3dB/oct. (0.5g RMS).</p>
Vibration Survival	<p>Random 5-20 Hz: 0.05 g²/Hz</p> <p>20-150 Hz: -3dB/oct. (1.7g RMS).</p>
Shock	Half sine 20g/11ms

Table 5 Technical Specifications

7 MAINTENANCE GUIDELINES

When properly installed the TT-3026M needs no maintenance. After approximately 10 years an internal battery has to be replaced¹, and the transceiver must be sent for service.

7.1 HANDLING PRECAUTIONS

- Do not expose the transceivers parting line (the blue styling gasket) & connector to high-pressure water jets.
- Exposure of chemical containing alkalis may result in physical degradation of the transceiver.
- Do not expose the transceiver to acid curing silicone.
- Avoid contact with solvents.

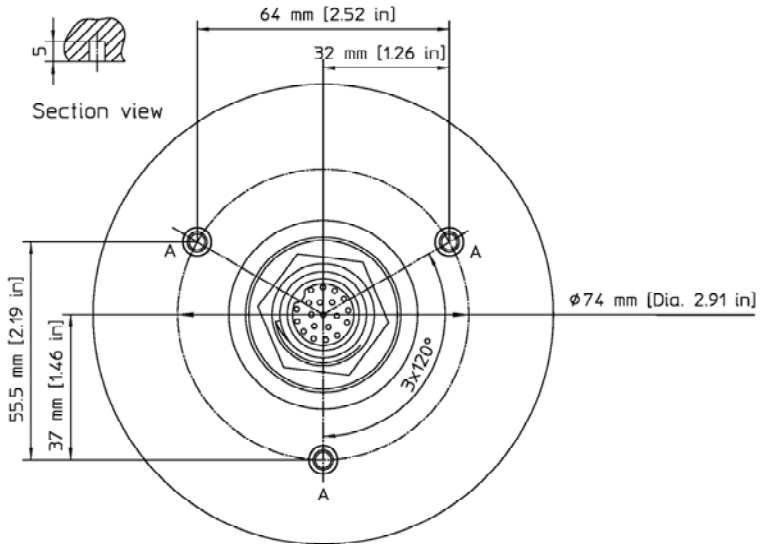
Do not paint the transceiver. If it's absolutely necessary to paint the transceiver, ideally water-based paints or paint system based on mild solvents should be selected.

¹ The battery life time is limited by age, not power consumption, thus the battery life time is not extended by having the system powered on.

8 APPENDIX A – MOUNTING THE ANTENNA

8.1 MOUNTING GUIDE

Warning: M4 screws must be inserted maximum 5mm in the base of the transceiver.



Maximum rotational force required to pull the insert out: 1,2 Nm.

For connector: Drilled hole 32mm (1.26") diameter
 A: 3 x Drilled holes 5mm (0.2") diameter for M4 screws.

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9 APPENDIX B - INTERCONNECTION BOX

The TT-3616D Interconnection Box is NOT part of the TT-3000 LRIT package! However the TT-3616D may be purchased separately if you would like to have a more flexible installation.

The TT-3616D Interconnection Box is designed to facilitate a simple and robust interconnection of the various system components.



Figure 10 Outside view of TT-3616D

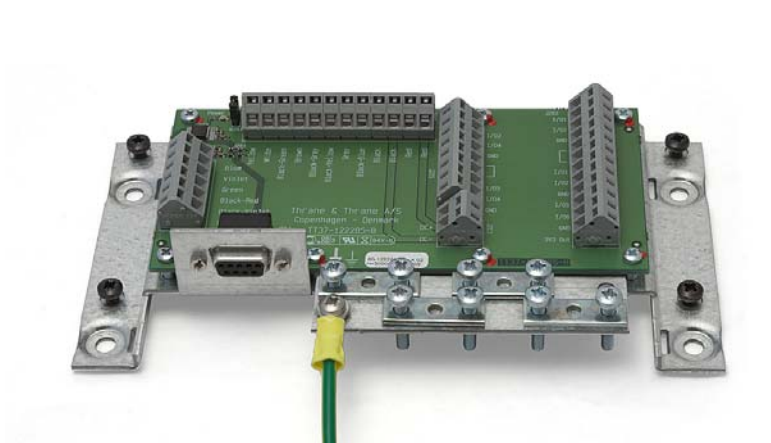


Figure 11 Inside view of TT-3616D

9.1.1 MOUNTING OF TT-3616D

The TT-3616D is designed to be mounted on a flat surface anywhere inside a vessel and to be located up to 50 meters away from the TT-3026M mini-C Transceiver.

In order to ease the installation, please observe the minimum clearing area as given in Figure 12.

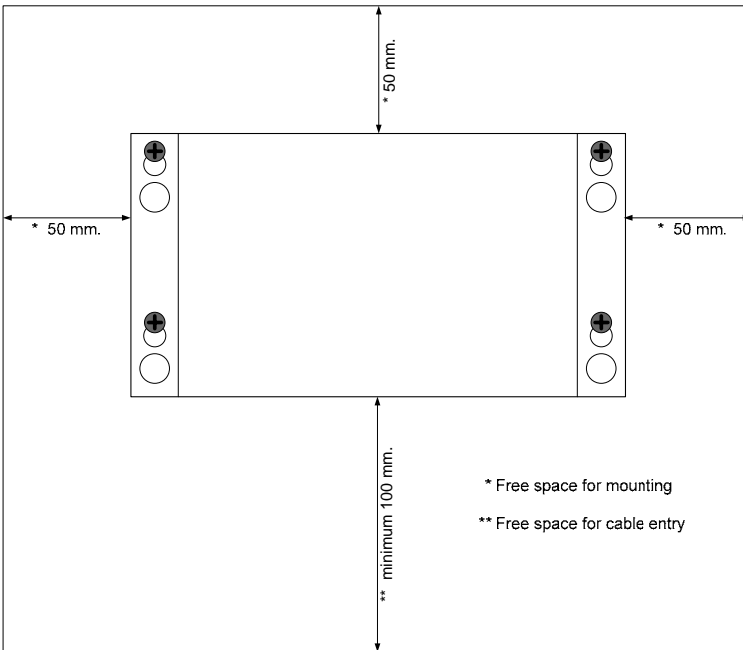


Figure 12 Recommended free space around TT-3616D.

The unit must be fastened by the used of 4 screws, one in each corner of the chassis as indicated by Figure 13. The accessories for TT-3616D include 2 different types of screws for the purpose, M5x12 and 5.5x25.



Figure 13 Drill template. All measures in mm.

The best grounding is made by fixing the chassis directly on to the ships structure (provided it's made of metal). If proper grounding can not be made this way, then connect the pre-mounted grounding wire to the ships structure. Find an appropriate location as close as possible to the TT-3616D and shorten the grounding wire accordingly. Terminate the grounding wire with the yellow ring terminal found in the accessory kit.

The correct (pre-mounted) position of the grounding wire can be seen on Figure 11. Please note the use of a washer underneath the yellow ring terminal.

The grounding wire delivered with the TT-3616D has a length of 1 meter and a wire cross section of 4mm^2 . Avoid extending the length of the grounding wire, as the protective effect will be severely degraded in such a case.

9.1.2 HANDLING OF WIRE TERMINALS IN TT-3616D

To help inserting wires into the terminals, a special tool is delivered as part of the accessory kit. It is used as shown in Figure 14.



Please be careful not to apply too much pressure, as this might damage the top of the terminal housing.

In case the special tool is lost, a small screwdriver can be used as well.

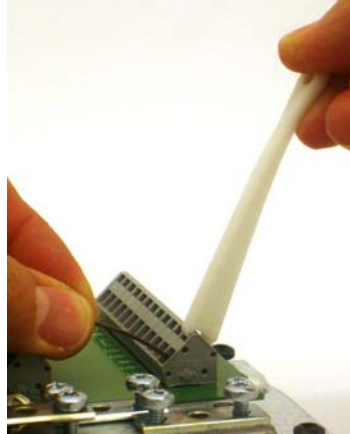


Figure 14 Wire tool

9.1.3 CONNECTING POWER TO TT-3616D

The TT-3000LRIT system is designed to operate on floating DC in the range 10.5 - 32 V when using 20-meter transceiver connection cable and 16 - 32 V when using 50-meter transceiver connection cable, which makes an AC/DC converter needed, in case the system works in an AC environment.

NOTE the requirement for floating DC of minimum 16 V when using a transceiver connection cable longer than 20 meters. This is important for the operation of the TT-3000 LRIT system.

When connecting the cable to TT-3616D, make sure the cable screen is properly terminated at the cable relief bracket as shown in Figure 15. Connect the positive supply wire to the terminal denoted DC+ and the negative supply wire to the terminal denoted DC-.

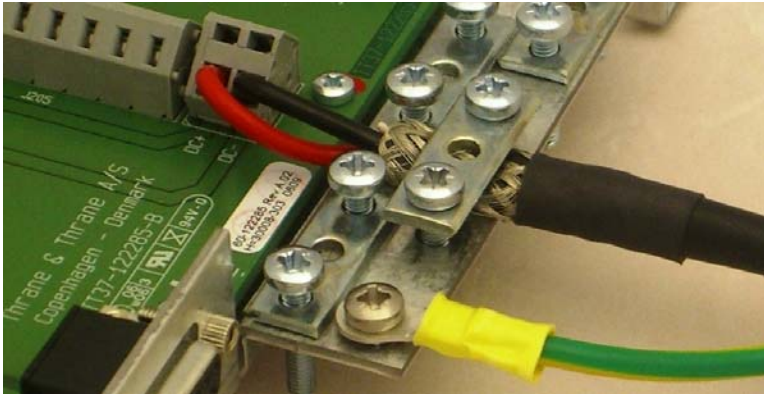


Figure 15 Power cable connections.

When power is switched on, the red LED denoted “DC in” should be turned on.

Please note that the jumper on W201 must remain on at all times.

9.1.4 CONNECTING TT-3026M TO TT-3616D

In order to prepare the transceiver cable for mounting, start by removing 20 cm. of isolation as shown in Figure 16.



Figure 16 Transceiver cable preparation.

Then wind the tinned wire around the isolation as shown in Figure 17 in order to prepare for a proper grounding of the cable screen.

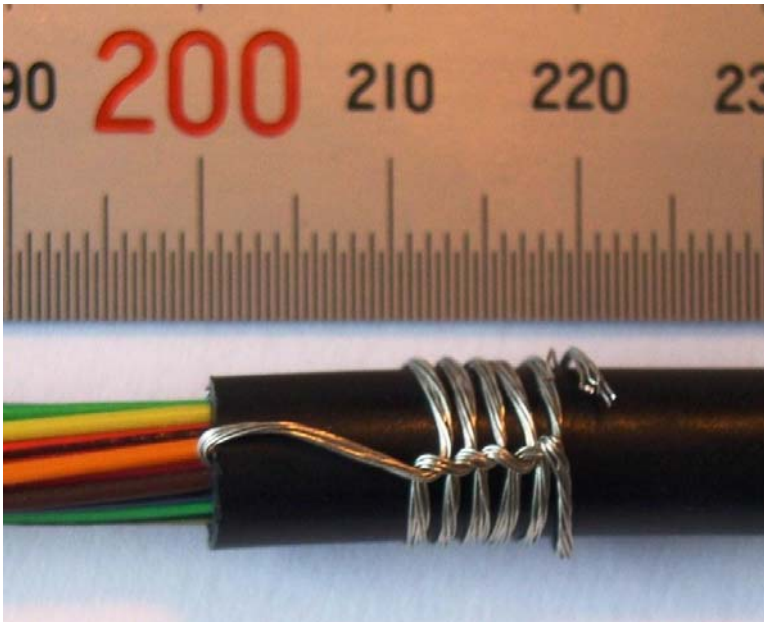


Figure 17 Preparation for grounding of the cable screen.

Then fasten the cable firmly in the cable relief bracket of the TT-3616D as shown in Figure 18.



Figure 18 Fixation of the transceiver cable in TT-3616D.

Finally connect the individual wires to the 12 + 6 pole terminal blocks. They are labelled by wire colour. Connect the Transceiver cable as directed by these labels. Start by connecting the thick power wires and then continue towards the other end of the connector as shown in Figure 19.

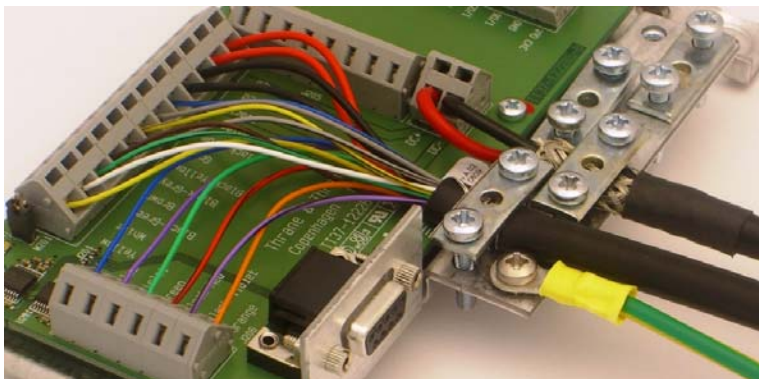


Figure 19 Mounting of transceiver cable wires.

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